were absorbed by those investigations for which the institution was established, I had the satisfaction of obtaining a sufficient number of stellar photographs to occupy not only my own lifetime, but many more, in their measurement and proper computation.

We photographed no northern stars there except the Pleiades and the Præsepe. Of the Pleiades I brought home sixteen plates, with two impressions of the whole group upon each, made in five different years, from 1872 to 1882, inclusive. Although the centre of the cluster never attains a greater altitude at Cordova than 34° 50′, some of the plates contain seventy stars. All but one of Bessel's stars are there, which belong within the limits of the field, the missing one being of the magnitude 9½, and there are yet other stars of the magnitudes 10, 10½, and 11. Of the Præsepe there are five plates, and with a correspondingly increased number of stars.

About seventy southern clusters have been repeatedly photographed at Cordova, comprising all those of the southern hemisphere which seemed important, also somewhat more than a hundred double stars, being a sufficient number to serve as a good test of the method. The total number of photographs now on hand is somewhat less than 1300, only few having been preserved in which the images were not circular.

Especial attention, however, was given for many years to taking frequent impressions, at the proper seasons, of four stars selected, on account of their large proper motion, as likely to manifest appreciable annual parallaxes. The refined and elaborate observations of Drs. Gill and Elkin, at Cape Town, have been made, computed, and published, while the Cordova photographs have lain untouched in their boxes. There is but one of my four stars, β Hydri, which is not included in their list. Still, it will be a matter of much interest to apply the photographic investigation to the same problem, even if for no other purpose than a comparison of the results of the two methods.

I am convinced that the Cordova plates contain a large number of stars as faint as the eleventh magnitude of Argelander's scale, and believe that these are much the earliest photographs of stars fainter than Mr. Rutherfurd's of 1865 and 1866. There are several plates, covering about a degree square, which cannot contain less than 550 stars, and I believe that some of them contain a greater number. Such are those of the cluster Lac. 4375 and that near X Carinæ.

The region in the vicinity of η Carinæ, and that magnificent tract in Sagittarius which is too densely sown with stars to be considered merely a portion of the Milky Way, and yet too large and undefined to be regarded simply as a cluster, were both of them taken several times, during the years 1875–82, in series of overlapping photographs, each containing about a square degree, and recorded upon a glass surface of 9 by 12 centimetres. In their present form they are of course of small value for scientific use, inasmuch as the stars are too crowded for their configurations to be easily perceived; and although these two series form, in fact, maps of considerable regions in the sky, still the record is of a very perishable nature, and of small avail for use by astronomers until it shall have been translated into an enduring and numerical form by micrometric measurement.

In this connection I may say that one of the greatest of my present anxieties regarding the Cordova photographs arises from a discovery of the ease with which the collodion or gelatine film may become detached from the glass. The Argentine Government has assigned a moderate sum for the prosecution of the measurements, and with this some progress has already been made. It is but right to add that the full amount was given for which I asked. Still, it is now quite inadequate, in consequence of the unfortunate depreciation of the national currency; and, in the present financial crisis there, I cannot reasonably expect more. Yet this matter of prompt measurement appears to me at present much more important than it did while I was unaware of the facility with which the film can blister and peel.

In 1883, after Mr. Common's brilliant success in photographing nebulas with his great 3-foot reflector, he proposed to me a joint arrangement for photographing the whole heavens. My work at Cordova was so near its close that it was out of the question to undertake anything new; but the immense labour requisite for the measurement of the plates would, under any circumstances, have tended to deter me. It is an undertaking demanding the joint energy, application, and material resources of a large number of persons, if the results are to be made available for astronomical use; indeed, I see no other astronomical value in the unmeasured photographs than the possibility of confirming at some future epoch the existence of relative motion previously detected or made probable by some other investigation.

Since then the process of photographic charting is said to have been systematically undertaken by the Brothers Henry at Paris. I have seen none of their plates; but their sharpness is highly spoken of, and the work appears to be prosecuted with much skill and very sensitive plates. There can of course be no question as to the value of any permanent record whatsoever, corresponding to a known date; yet I cannot feel that any essential advance is likely to be made in this way until the photographic record shall have been brought within the range of numerical expression.

The measurements of the Cordova photographs, thus far completed, are those of the double stars, the four stars with large proper motion, of the Pleiades, of the Præsepe, and of the clusters Lac. 4375 and κ Crucis. The corresponding computations have been made, as yet, only for a portion of the Pleiades impressions, but I am hopeful of completing all these at a comparatively early date. We shall then be able not only to compare the results with Bessel's of forty-five years ago, but to test the deduced values of the proper motions by means of the photographic determinations of 1865 and 1866. Meanwhile, the valuable memoir of Wolf has been published, giving closely approximate positions for 571 stars of the group, and Dr. Elkin has recently been executing at New Haven a heliometric triangulation of the principal stars. Our photographic results will have to be confronted with his delicate heliometric ones; and, should they bear this test with tolerable success, it will be all that can reasonably be desired.

B. A. GOULD

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

PROF. W. GRYLLS ADAMS, F.R.S., will deliver, at King's College, London, a course of lectures on Electricity and Magnetism and their applications to Electric Lighting, Transmission of Power, &c., during the academical year 1886–87. A course of practical work in Electrical Testing and Measurement with especial reference to Electrical Engineering will also be carried on under his direction in the Wheatstone Laboratory. In the Wheatstone Laboratory, which is open daily for research from 1 to 4, except on Saturdays, there are special courses of practical work for students preparing for the Science Examinations of the University of London.

IT is purposed to celebrate, in a befitting manner, from November 6 to 8 next, the 250th anniversary of the founding of Harvard University, Cambridge, Massachusetts. The University was established on November 7, 1636, by an Act of the Colonial Legislature, and was named after John Harvard, who was a liberal benefactor of the new institution. Harvard is the oldest University in North America. The southern portion of the Continent possesses one many years older—the University of St. Mark, at Lima, founded in 1551 by the Emperor Charles V.

SCIENTIFIC SERIALS

Bulletin de l'Académie Royale de Belgique, July.—Modern kinetics and the dynamism of the future, by G. A. Hirn. The author replies to the arguments urged by M. Clausius against his view of the kinetic theory in its application to the resistance of gases. He continues to treat the question in connection with his peculiar spiritualistic opinions, and endeavours to overthrow the theory now generally accepted by physicists, because of the disastrous consequences which he supposes it would have on the progress of mankind.—On a class of conjugated polynomes, by J. Deruyts. This memoir, which is a further development of the author's previous researches, deals more especially with the important functions presented by certain polynomes in the approximate calculation of definite integrals.—On the distribution of the regenerate nerves, by C. Vauclair. In this paper the author deals with the peripheric distribution of the regenerate nerves compared with that of the primitive nervous system.—Essay on the origin of the Fraunhofer rays in relation to the constitution of the sun, by Ch. Fievez. Given the high temperature, chemical composition, and slight mean density of the sun, its chemical elements cannot exist in the solid or fluid state, or even to any large extent in the condition of highly compressed vapours. Assuming, further, with most physicists, that the sun consists of a gaseous mass whose temperature increases from the circumference towards the centre, it is argued that the solar spectrum must be formed by the superposition of all the radiations of the chemical elements present in the sun. The luminous part of the spectrum would thus be constituted by the radiations of like vibratory period, and Fraunhofer lines by the radiations of unlike vibratory periods. From this it would follow that a chemical element might exist in the sun without being revealed by a dark line in the solar spectrum.

Schriften der Physikalische-Ökonomischen Gesellschaft zu Königsberg i/Pr., 1885.—Herr Fritsch here gives the result of a study of certain gaps in the pith of Coniferæ, discovered by Prof. Caspary some years ago. In its middle course the pith of a year's growth consists of elongated parenchyma, but at the end of the growth it presents cubic or egg-shaped cells in loose union. Those gaps the author finds in species of the genera Abies, Picea, and Larix, and in *Cedrus Deodara.* The last-named differs from the others in not having a partition of cross-lying cells through the pith, above the gaps. All Coniferæ with persistent bud scales have this, and some Coniferæ (*Tsuga canadensis* and *Torreya nucifera*) have it, and are without the gaps. Finally, the Junipereæ, Podocarpeæ, Taxineæ, and Pinus have neither. The gaps seem to arise through stretching of the wood-cells, and their size depends on the age and moisture of the stem and branches.—Herr Franz writes on the magnetism observed at the end of long iron well-tubes (200 and 250 m.) at Königsberg, and of some railway lines. The attractive force was proportional to the distance (not its square), the magnetism being pretty equally distributed over a line several metres long. In one well, the horizontal component at 1 metre distance was as much as fifteen times that of the earth's magnetism.—Herr Klien describes experiments in plant cultivation by the water-method (specifying the substances given in solution and their amount), and points out its advantage in study of the action of poisons, such as the sulphocyanite of ammonium occurring in ammonia superphosphate from gas manufacture, and spoiling that product for manure purposes.—A paper by Herr Scharlop appears to throw light on the production of some prehistoric urns in Prussia, from a mode of manufacture which has lately died out.—Dr. Tischler discusses the representations of weapons and costumes on old bronzes of the Hallstadt-Italian period.

SOCIETIES AND ACADEMIES

London

Entomological Society, September 1.—Robert McLachlan, F.R.S., President, in the chair.—The following gentlemen were elected Fellows:—The Rev. Prof. Dickson, D.D., and Messrs. P. Cowell, A. O. Walker, and Lyddon Surrage.—The President remarked with regard to the gnats from the Kent Waterworks, exhibited at the last meeting, that Prof. Westwood had since informed Mr. Douglas that they were only *Culex pipiens.*—Mr. Slater exhibited certain parasites found on the body of a larva of *Smerinthus tiliæ*, which Mr. Waterhouse believed to be *Uropoda vegetans*, a species of *Acari.*—Mr. W. Warren exhibited *Eupithecia fraxinata*, *E. innotata*, a variety of *E. satyrata*, a *Gelechia* caught in Wicken Fen twenty years ago by Mr. Bond, and believed to be a new species, *G. fumatella*, *G. vilella*, *Lithocolletis scabiosella*, and *Catoptria parvulana.* He also exhibited larvæ of *Gelechia vilella.*—Mr. South exhibited specimens of *Dicrorampha distinctana*, and stated that he considered it to be merely a local form of *D. consortana*, from which, in the larval stage, it could not be separated.—Mr. Stevens exhibited a living specimen of *Clerus formicarius*, recently found under the bark of an ash-tree in Arundel Park.—Mr. Billups exhibited *Chrysis succincta*, Linn., taken by sweeping at Chobham on July 28 last; he also exhibited *Microphysa elegantula*, taken at Broadstairs in August last.—The Rev. W. W. Fowler exhibited, on behalf of Mr. Theodore Wood, a larva of *Langelandia anophthalma*, a species new to Britain.—Mr. H. Goss exhibited specimens of *Oxygastra Curtisi* recently taken near Christchurch, Hants. He stated that he had met with the species in the same locality in 1878, but had never seen it anywhere else in the United Kingdom, nor was he aware of any recent record of its capture. Mr. McLachlan observed that the species was taken many years ago in Dorsetshire by the late Mr. Dale, but that he knew of no recent captures except those recorded by Mr. Goss. He also made some remarks as to the distribution of the species on the continent of Europe.—Mr. McLachlan exhibited a specimen of *Dilar meridionalis* taken by him in July last in the Pyrenees, also about 150 examples of the genus *Chrysopa* from the same district. Amongst them were *C. vulgaris*, *perla*, *Walkeri*, *viridana*, *tenella*, *prasina*, *flava*, *septempunctata*, *flavifrons*, and others not yet fully identified. He also exhibited a few Coleoptera from the same district, and remarked on the extraordinary abundance of a pretty Lamellicorn, which was so common as to give the meadows the appearance of being studded with multitudes of brilliant blue flowers.—Mr. C. O. Waterhouse called attention to the numerous reports which had lately appeared in the newspapers of the supposed occurrence of the Hessian Fly (*Cecidomyia destructor*) in Britain, and inquired whether any communication on the subject had reached the Society. The Rev. W. W. Fowler stated that he had been in communication with Miss Ormerod on the subject, and that she had informed him that neither the imago nor larva of the species had been seen, and that the identity of the species rested on the supposed discovery of the pupa.—Mr. A. H. Swinton communicated a paper entitled "The Dances of the Golden Swift." In this paper the author expressed an opinion that the peculiar oscillating flight of the male of this and allied species had the effect of distributing certain odours for the purpose of attracting the females.

Paris

Academy of Sciences, September 27.—M. Émile Blanchard in the chair.—Researches on the sugars, by M. Berthelot. The results are given of recent studies of some new principles obtained from the association of sugars with themselves, not by a stable combination of the class of saccharose substances, but by a combination easily dissolved, analogous to that of the hydrates and alcoholates. The facts observed illustrate the difficulties so often met with in the preparation of the double salts. They supply a fresh proof of the special part played by the dissolvents in the extraction of immediate principles, for, according as water or alcohol is employed, melitose or raffinose may be obtained.—Conditions determining the rapidity of images in chronophotography, by M. Marey. By the process here described, which is based on M. Chevreul's method of obtaining a perfectly black ground, the author is enabled to reduce the time of pose for each image to the two-thousandth of a second, and hopes by further improved dispositions to reduce it still more. The new photographs show that this reduction of time greatly increases the delicacy of the images obtained by this process of chronophotography.—Kinematic analysis of the locomotion of a horse, by M. Marey. In this paper are described and illustrated the movements of the fore-leg in the step, trot, and gallop. The tendency to economy of labour displayed in various degrees in the movements of all "animal machines" appears to attain the greatest perfection in the action of the horse, being, however, less evident in the trot and the gallop than in the slow pace.—Note on the removal of the Imperial Observatory of Rio de Janeiro to a new site, by M. Cruls. The new site, to which the Observatory will soon be removed, occupies about 40 hectares (100 acres) of the Imperial Fazenda of Santa Cruz, the usufruct of which is granted by the Emperor for this purpose. The new Observatory will stand on the same parallel, and about 2 metres to the west of the present establishment, and will be able to undertake observations both on atmospheric electricity and terrestrial magnetism much more successfully than was possible in its old home.—On the transformation of algebraic surfaces in themselves, and on a fundamental number in the theory of surfaces, by M. E. Picard. Having recently shown that surfaces capable of transformation in themselves by a birational substitution, including two arbitrary parameters, are of the genus zero or one, the author now examines the case of a single parameter, which he finds leads to totally different conclusions.—On a new method of determining the coefficient of expansion for solids, by M. Robert Weber. If a solid body be suspended like a pendulum, its oscillations will depend upon its form, its mass, and the distance of its molecules from the axis of rotation. At two varying temperatures this distance varies, whence results a change in the oscillations. Hence for a given body there is a determined relation between its temperature, *u*, the coefficient